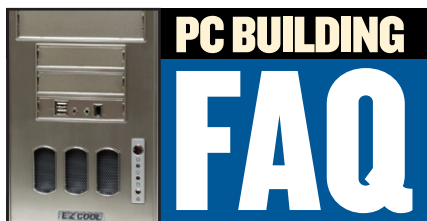




PC Builder

Setting up a RAID array is an excellent way to protect important data. Simon Williams explains how setting up more than one hard disk on your system can keep your work safer and boost performance



Q If I have a mirrored array, do I still need to make backups?

A While a mirrored array is an excellent way to protect your data, it doesn't remove the need to make regular backups. For example, if you delete a file from your computer, it is deleted from both copies instantly. To protect your files against accidents, stick with your current backup regime. If you haven't got one, start one now.

Mirroring is designed to counteract the mechanical or electronic failure of a hard disk, which could potentially mean the loss of all your data at once. It also makes your system a lot easier to repair, as you still have a working Windows installation, and you can plug a new disk into your system and rebuild your array with a minimum of fuss.

Q I'm interested in RAID 1 (mirroring), but is there any way I can use it to make backups of my data?

A RAID 1 setup uses two hard disks and writes data to them both. The upshot is that you get a copy of your data instantly. However, deleting a file from your PC deletes it from both drives, so it's not ideal for a backup.

That said, if you remove the second disk from the computer, you'll have a complete backup of your data from the time you removed it. Replace that disk with a third, blank one, and your RAID 1 system will copy all your data to the third disk and continue as normal, leaving you with a safe backup. Interchange the two hard disks at regular intervals and you've got a backup system.

Of course, delving around inside your PC case every time you need to swap disks is a pain, so why not buy yourself a removable drive cage? Icy Box's ATA-SATA Mobile Rack (£14 including VAT, www.thecoolingshop.com) fits in a 5¼" drive bay. Your hard disk is mounted in a cage, which you can remove easily from the housing whenever you like. Buy two, so you have a spare drive cage, and you can swap your spare mirrored hard disk and use that as a backup.

david@computersshopper.co.uk

Protecting our data is something most of us forget about in the vain hope that nothing will ever go wrong. Should the hard disk in your PC die, though, you are likely to lose all your data, and you'll have to reinstall Windows and all your applications. Any settings you've put in place to tailor the system to your needs will have to be remade. And however thorough your backup regime may be, something is bound to go missing.

Fortunately, most desktop PCs have a built-in way of protecting data using two or more hard disks: the redundant array of inexpensive disks (RAID). Using multiple disks in a RAID array gives you a single logical drive, which you can use to improve performance, data protection or both, depending on the RAID level you set.

Most new motherboards support RAID. Check the manual and look for instructions – most boards have dedicated RAID ports into which you plug your hard disks. If you have an older motherboard without RAID, you can buy a PCI Serial ATA (SATA) card that does the job. Expect to pay upwards of £35 for a card that supports four hard disks.

LEVEL HEADED

You need to pick the level of RAID you want to use. The common modes are RAID 0, 1, 0+1 and 5. RAID 0, also called striping, is the most basic and works with two or more disks. Data written to the disk is split into blocks and written alternately to each disk in the array. It increases performance as you've got multiple disks running together, so data transfers are much faster. You also benefit from the total capacity of all the hard disks: two 100GB hard disks gives a total capacity of 200GB. However, we don't recommend it because if any disk in the array should fail, you'll lose all your data.

RAID 1, also called mirroring, uses two hard disks, but all data is written to both disks in the array. This means you get only the capacity of one of the drives, though: two 100GB hard disks give a total capacity of 100GB. However, you have a copy of all your data. If either disk fails, the other disk still has all your files on it and you can continue to use your PC. Replace the faulty disk with a blank one, and it's automatically filled with copies of your files.

RAID 1 doesn't offer much of a performance increase over a standard disk, but for essential files, such as digital photos, you've got an instant backup.

RAID 0+1 uses an even number of disks, with a minimum of four. It splits the array in half and creates two RAID 0 arrays, which it then mirrors. This means that you get the performance bonus of RAID 0 with the protection of RAID 1. However, you get only half the total capacity of the disks: four 100GB disks give a total capacity of 200GB.

RAID 5 is the most advanced form of RAID. It needs at least three hard disks and stripes data across them in a similar way to RAID 0. However, it

also writes parity information across all three disks. This information is sufficient that, if a hard disk should fail, the other two contain enough information to rebuild your data. Replace the faulty disk with a blank one and the system automatically rebuilds the array for you. The parity information is equal to one disk's worth of data, so your array has the capacity of all the hard disks minus one: three 100GB hard disks give a capacity of 200GB.

For simplicity's sake, we'd suggest that you use RAID 1. It's easy to implement, requires just two hard disks and makes a complete backup of your data. Here we show you how to configure a RAID 1 array, but if you'd like to try one of the other RAID levels, you can still follow our help. They are all set up in a similar way.

When you're choosing hard disks to build into a RAID array, you should buy identical models. This ensures they offer the same levels of performance. You can buy disks with different capacities, but the RAID array will use only the capacity of the smallest disk for each hard disk. If you buy one 100GB hard disk and two 120GB hard disks, you'll be able to use only 100GB of each disk, losing 20GB from each of the larger disks.

For RAID 1 you need two identical hard disks so that one can make an exact copy of the other. For other RAID levels, data is split into blocks and written to each disk alternately. The RAID controller has to know that all disks are the same size – otherwise, if one disk fills up before the others, working out how to stripe the data becomes too difficult. If you have an existing hard disk, check its model number and buy a matching disk online. You might also want to buy a spare disk so that you can install the second one if the original disks fails.

RAID OF LIGHT

Our 'How to... set up RAID' guide opposite covers installing RAID from scratch on a brand new PC. We've used an MSI K8N SLI motherboard, but RAID configuration differs from motherboard to motherboard, so check your manual and follow the instructions carefully.

If you want to add RAID to an existing PC, you may consider adding it as you would an extra hard disk. Without disturbing the hard disk that holds your Windows installation, you can add two further drives in a mirrored array and combine them to form the second drive in your system. The obvious advantage is that installation is much simpler and there is no risk to the data on your existing drive. The disadvantage is that the data already on that drive is no more secure than before. The steps you must take are very similar to those in our guide, bar the installing Windows option.

In all cases, you must first read the manual to check that your motherboard supports RAID. Next, you need to check which ports it uses.



Some motherboards have dedicated RAID ports, which can be used only to set up RAID arrays. Your motherboard's manual will show you which ports you can use. If you don't have RAID support, you'll have to buy a RAID controller and install it in your PC. There's little point in buying a parallel ATA RAID card – we suggest you opt for a SATA card instead. The hard disks are no more expensive and the cabling is neater. Finally, back up your existing data. Installing a RAID array shouldn't cause any damage, but when opening up a PC it's best to be safe.

If you're installing a fresh version of Windows on a RAID array, you'll need a floppy disk drive and a copy of the RAID driver on a floppy disk. Windows Setup will not recognise your RAID array when you get through the installer, and you'll have to tell it manually to load the correct driver. Unfortunately, Windows doesn't recognise any media except floppy disks for drivers, which can be a pain if you don't have a floppy drive in your PC.

Here we're setting up a mirrored array under Windows XP Home, on an MSI K8N SLI

motherboard, which uses an nVidia nForce 4 chipset. The instructions should apply to any motherboard that uses the same chipset and will be similar for other RAID controllers. **CS**

NEXT MONTH

BUILD AN IN-CAR PC

Enjoy music, movies and satellite navigation on the road with our help

HOW TO... Set up RAID

Here's how to install a RAID array from scratch on a brand new PC.

1 As supplied, the MSI K8N SLI motherboard's RAID controller is not enabled. Although you use the same SATA hard disk controllers, you have four separate lines available. To tell the system you're setting up a RAID, enter the main system BIOS by pressing Delete while the system starts up. At the main menu, select Integrated Peripherals, then nVidia RAID config. Set 'RAID enable' to Enabled and SATA 1 RAID and SATA 2 RAID as Enabled too. Exit, saving the configuration. When you reboot, press F10 to enter the RAID BIOS.

2 You now need to set up a mirrored RAID array. After pressing F10 during startup, you'll arrive at the Setup screen. Select Mirroring as the RAID Mode; you can select other RAID modes, as described opposite, if you prefer. Then tab to the Free Disks panel. Select each of the drives there and use the right arrow to shift

them into the Array Disks panel. Once the drives show up under Array Disks, press F7 to finish the setup and Y to clear the drives. The screen should show a single healthy array, so press B to make it bootable and Ctrl-X to exit the RAID Setup.

3 Now install Windows. You'll need a floppy disk with the RAID drivers on it, so Windows Setup can include them as it builds its installation. Press F6 when Setup displays its message about external RAID drivers at the start of the installation. When it asks for the disk, insert the floppy and copy the drivers across. In the case of the nVidia controller, there are two drivers, the RAID class driver and the nForce storage controller, both of which must be copied. Let Setup format the drives in NTFS and don't remove the floppy until Setup is complete.

4 Once you've finished the Windows installation, select Control Panel, Administrative Tools, Computer Management and Disk Management and you'll see the RAID array, treated as a single drive, with the formatted capacity of just one of the mirrored drives. The fact that you have a mirrored array is concealed from Windows, which treats it as a single drive for all tasks. You can perform all the actions you would on a single drive, including defragmentation and

drive scans. All the while, your data is safely stored in two identical images, one on each of the drives in the array.

5 When one of the hard disks in an array fails – and if you run a hard disk for long enough, it will eventually fail – the drive controller continues to work satisfactorily with the single remaining drive. Call up the nvRAID manager applet under Windows, and you'll see that only one drive shows as healthy. Turn off your PC, unplug the power and data cables from the failed drive and remove it from your PC. Replace it with a new blank drive, reconnect first the data and then the power cable and turn your PC back on. The nvRAID utility should show the two drives, although not yet as a working array.

6 Select the new drive and the Rebuild array option. Data from the remaining drive is copied to the new drive. This may take some time, but you can use your PC during the process. Eventually the rebuild finishes and the utility shows a healthy RAID array. Although we've shown what happens when a drive in an array fails and how the RAID system copes, this is likely to happen very infrequently. We forced the system to act by unplugging the power cable to one of the drives while it was running.

